

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-17 (Canceled).

18. (Currently Amended) A method of recognizing an object based on pattern matching using a gray-scale normalized correlation method, comprising:

storing a reference image including a foreground and a background, the foreground and the background providing a predetermined contrast pattern;

inputting an image of the object, the image including a foreground and a background, the foreground and the background providing a predetermined contrast pattern;

obtaining a function for giving the predetermined contrast pattern of the reference image corresponding to the predetermined contrast pattern of the input image, the function providing a predetermined form pattern, the predetermined form pattern including ~~one of a convex pattern and a concave~~ rectangular pattern; and

calculating a normalized correlation coefficient between the reference image and the input image using the function[[.]], the calculating step comprising:

calculating an autocorrelation coefficient of the reference image by assigning a density distribution value of a background area of the reference image to a first constant value and by assigning a density distribution value of a foreground area of the reference image to a second constant value different from the first constant value;

calculating a cross correlation coefficient between the reference image and the input image for the foreground and the background areas; and

obtaining the normalized correlation coefficient by dividing the cross correlation coefficient by a product of the autocorrelation coefficients of the input image and the reference image.

Claims 19 – 24 (Canceled).

25. (Previously Presented) The method as claimed in claim 18, wherein the obtaining step is carried out by designating a pattern of the reference image, overlaying an image of the pattern on the input image, and designating one of a density distribution of the image and a density of the image.

26. (Currently Amended) The method as claimed in claim 18, wherein the obtaining step is carried out by extracting an outline of the object wherein an area inside the outline serves as the foreground and an area outside the outline serves as the background, overlaying an image of the outline on the input image, and designating one of a density distribution of [said] the image and a density of the image.

Claims 27 - 29(Canceled).

30. (Currently Amended) A medium for recording a computer program having a method of recognizing an object based on pattern matching using a gray-scale normalized correlation method, the method comprising:

storing a reference image including a foreground and a background, the foreground and the background providing a predetermined contrast pattern;

inputting an image of the object, the image including a foreground and a background, the foreground and the background providing a predetermined contrast pattern;

obtaining a function for giving the predetermined contrast pattern of the reference image corresponding to the predetermined contrast pattern of the input image, the function providing a predetermined form pattern, the predetermined form pattern including ~~one of a convex pattern and a concave~~ rectangular pattern; and

calculating a normalized correlation coefficient between the reference image and the input image using the function[[.]], the calculating step comprising:

calculating an autocorrelation coefficient of the reference image by assigning a density distribution value of a background area of the reference image to a first constant value and by assigning a density distribution value of a foreground area of the reference image to a second constant value different from the first constant value;

calculating a cross correlation coefficient between the reference image and the input image for the foreground and the background areas; and

obtaining the normalized correlation coefficient by dividing the cross correlation coefficient by a product of the autocorrelation coefficients of the input image and the reference image.

Claims 31 – 39 (Canceled).

40. (Currently Amended) The method as claimed in claim 18, wherein the calculating step further comprises:

~~calculating an autocorrelation coefficient of the reference image by assigning a density distribution value of a background area of the reference image to a first constant value and by assigning a density distribution value of a foreground area of the reference image to a second constant value different from the first constant value;~~

~~calculating a sum of density values of the input image corresponding to [[a]] the foreground area of the reference image; and~~

~~calculating a sum of density values of the input image corresponding to a background area of the reference image;~~

~~calculating a cross correlation coefficient between the reference image and the input image for the foreground and the background areas; and~~

~~obtaining the normalized correlation coefficient by dividing the cross correlation coefficient by a product of the autocorrelation coefficients of the input image and the reference image.~~

41. (New) The method as claimed in claim 18, wherein the autocorrelation coefficient and the cross correlation coefficient of the reference image are calculated with the background area of the reference image removed.

42. (New) The medium as claimed in claim 30, wherein the obtaining step is carried out by designating a pattern of the reference image, overlaying an image of the pattern on the input image, and designating one of a density distribution of the image and a density of the image.

43. (New) The medium as claimed in claim 30, wherein the obtaining step is carried out by extracting an outline of the object wherein an area inside the outline serves as

the foreground and an area outside the outline serves as the background, overlaying an image of the outline on the input image, and designating one of a density distribution of the image and a density of the image.

44. (New) The medium as claimed in claim 30, wherein the autocorrelation coefficient of the reference image is calculated with the is background area of the reference image removed.

45. (New) The medium as claimed in claim 30, wherein the calculating step further comprises:

calculating a sum of density values of the input image corresponding to the foreground area of the reference image; and

calculating a sum of density values of the input image corresponding to the background area of the reference image.

46. (New) A method of recognizing an object based on pattern matching using a grayscale normalized correlation method, comprising:

storing a reference image including a foreground and a background, the foreground and the background providing a predetermined contrast pattern;

inputting an image of the object, the image including a foreground and a background, the foreground and the background providing a predetermined contrast pattern;

obtaining a function for giving the predetermined contrast pattern of the reference image corresponding to the predetermined contrast pattern of the input image, the function providing a predetermined form pattern, the predetermined form pattern including a rectangular pattern; and

calculating a normalized correlation coefficient between the reference image and the input image using the function, the calculating step comprising:

calculating an autocorrelation coefficient of the reference image by assigning a density distribution value of a background area of the reference image to a first constant value and by assigning a density distribution value of a foreground area of the reference image to a second constant value different from the first constant value;

calculating a sum of density values of the input image corresponding to the foreground area of the reference image;

calculating a sum of density values of the input image corresponding to the background area of the reference image;

calculating a cross correlation coefficient between the reference image and the input image for the foreground and the background areas; and

obtaining the normalized correlation coefficient by dividing the cross correlation coefficient by a product of the autocorrelation coefficients of the input image and the reference image.

47. (New) A medium for recording a computer program having a method of recognizing an object based on pattern matching using a grayscale normalized correlation method, the method comprising:

storing a reference image including a foreground and a background, the foreground and the background providing a predetermined contrast pattern;

inputting an image of the object, the image including a foreground and a background, the foreground and the background providing a predetermined contrast pattern;

obtaining a function for giving the predetermined contrast pattern of the reference image corresponding to the predetermined contrast pattern of the input image, the function providing a predetermined form pattern, the predetermined form pattern including a rectangular pattern; and

calculating a normalized correlation coefficient between the reference image and the input image using the function, the calculating step comprising:

calculating an autocorrelation coefficient of the reference image by assigning a density distribution value of a background area of the reference image to a first constant value and by assigning a density distribution value of a foreground area of the reference image to a second constant value different from the first constant value;

calculating a sum of density values of the input image corresponding to the foreground area of the reference image;

calculating a sum of density values of the input image corresponding to the background area of the reference image;

calculating a cross correlation coefficient between the reference image and the input image for the foreground and the background areas; and

obtaining the normalized correlation coefficient by dividing the cross correlation coefficient by a product of the autocorrelation coefficients of the input image and the reference image.

48. (New) The method as claimed in claim 40, wherein the calculating step further comprises:

calculating an autocorrelation coefficient of the reference image;

calculating a sum of density values of the input image corresponding to the background area of the reference image;

obtaining the normalized correlation coefficient by dividing the cross correlation coefficient by a product of the autocorrelation coefficients of the input image and the reference image.

49. (New) The method as claimed in claim 48, wherein the step of calculating an autocorrelation coefficient of the reference image is performed by assigning a density distribution value of a background area of the reference image to a first constant value and by assigning a density distribution value of a foreground area of the reference image to a second constant value different from the first constant value.